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ECONOMIC ANALYSIS OF ROUTING OF U. S. HIGHWAY no. 2--VICINITY OF HARLEM

ECONOMIC ANALYSIS
OF ROUTING OF

U. S. HIGHWAY NO. 2

IN THE VICINITY OF

HARLEM

PREPARED BY

PLANNING SURVEY DIVISION

OF

MONTANA STATE HIGHWAY COMMISSION

IN COOPERATION WITH

U. S. DEPARTMENT OF COMMERCE

BUREAU OF PUBLIC ROADS

JUNE 22, 1962

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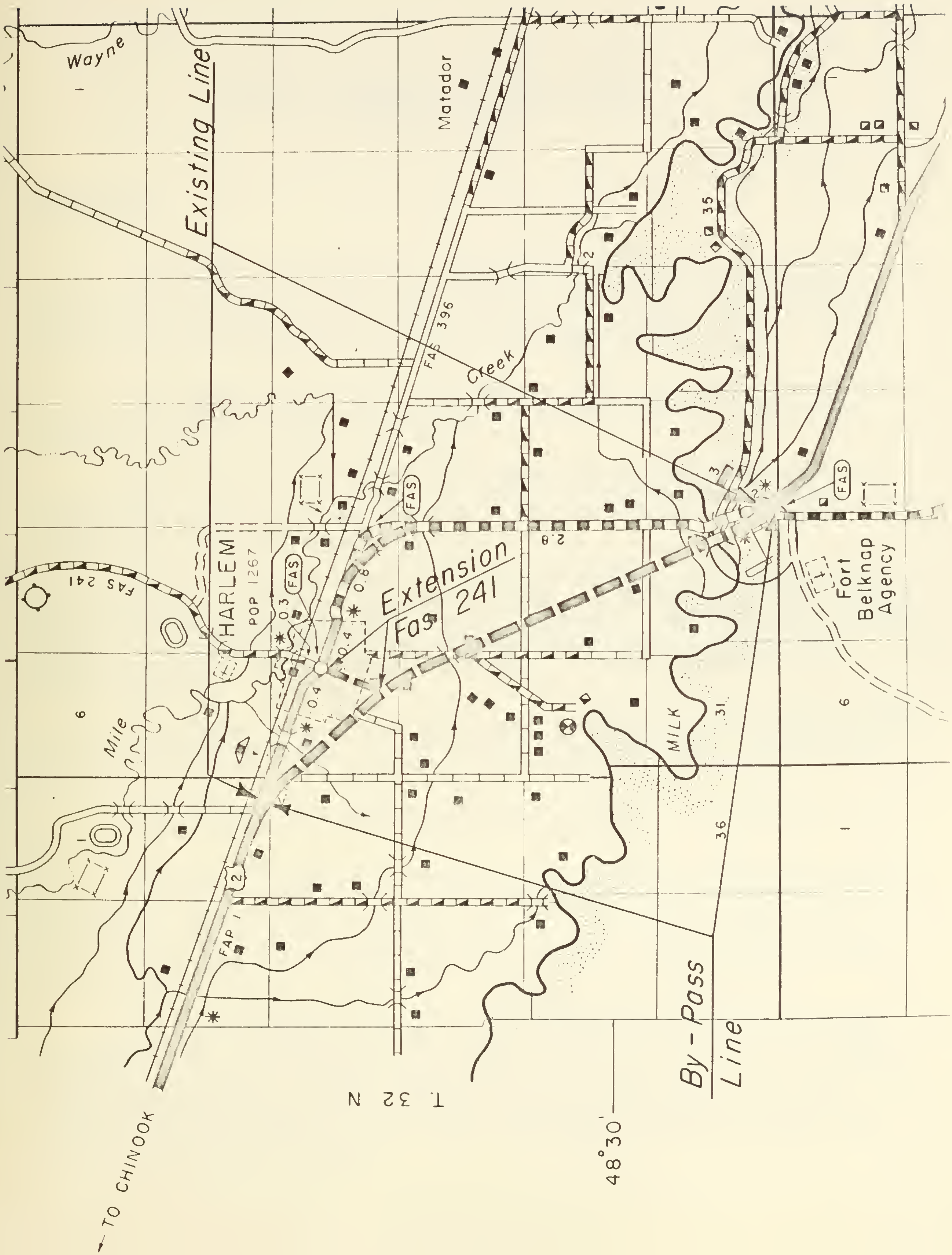
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FAS 396
Creek
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ECONOMIC ANALYSIS OF ALTERNATE LOCATIONS
FOR U. S. HIGHWAY NO. 2 IN THE VICINITY
OF HARLEM, MONTANA

June 22, 1962

INTRODUCTION

The present location of U. S. Highway No. 2 through and in the vicinity of Harlem follows a line that was constructed as far back as 1925. In general, it has narrow surface and roadway widths. Some sections have a surfaced width of 20 feet, with a roadway width of 25 feet. The predominant width east and southeast of the city is 22 feet for the surface and 30 feet for the roadway.

The section to the east and southeast of the city is located through an irrigated area where drainage and soil moisture create a problem. This section requires constant and expensive maintenance.

In order to fit the present development, the section through the city has two offsets from a direct line. A short distance east of the city, the highway makes a right angle turn on a short radius. This creates a dangerous situation for fast-moving highway traffic.

In the attempt to eliminate some of these problems associated with the present location, a survey was made about ten years ago on a new line which deviates from the present location at a point about 0.7 mile west of the city. This location extends in a southeasterly direction along the southern edge of the city and follows an alignment a short distance northeast of a power transmission line through this area.

The present bridge over the Milk River was originally constructed in 1925. It was later modified in 1940. It has a narrow width of 20 feet. A replacement structure is planned a short distance upstream from the present bridge.

The proposed new line joins the present highway a short distance east of the connection with FAS Route 376 leading to Hayes.

Because of opposition to the bypassing of the city, construction on the proposed line has been deferred for several years. A public hearing was held on the matter in Harlem on April 17, 1962. Part of the hearing was devoted to a discussion of traffic service features which were derived from a special traffic survey in the vicinity of Harlem during August of 1961. For full details of the hearing, reference should be made to the transcript of the discussion.

It was recommended by local interests during the hearing that the new construction follow as closely as possible the present location through the city and vicinity with the sharp curve east of the city being modified to meet present construction standards. Another suggestion was also made that the new construction continue east of the city along the general location of FAS Route 396 leading to Savoy and beyond there to a point east of the Dodson overpass where this line would rejoin the present highway.

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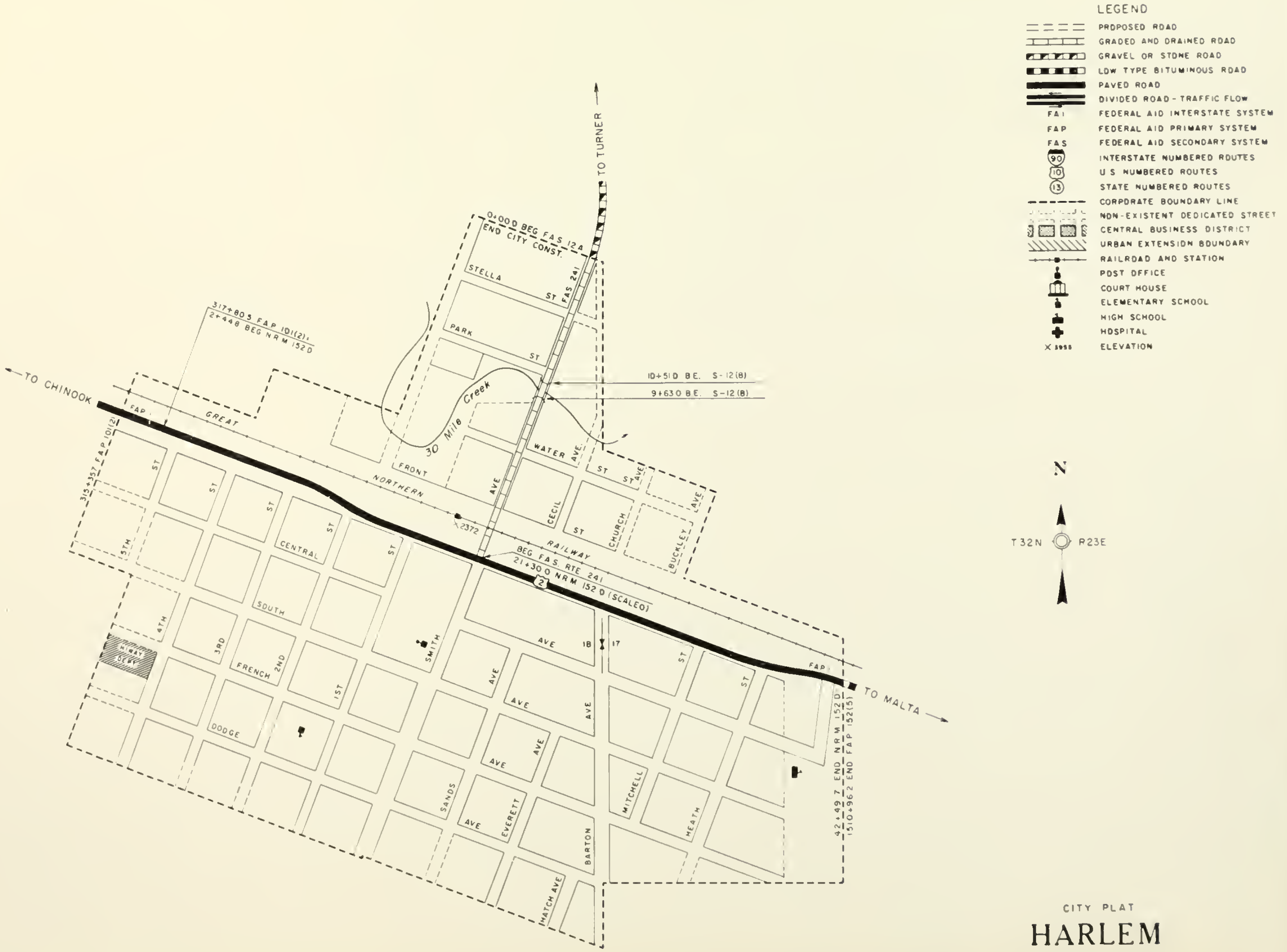

CITY PLAT

HARLEM

BLAINE COUNTY

MONTANA

1960 CENSUS 1,262

SCALE IN FEET

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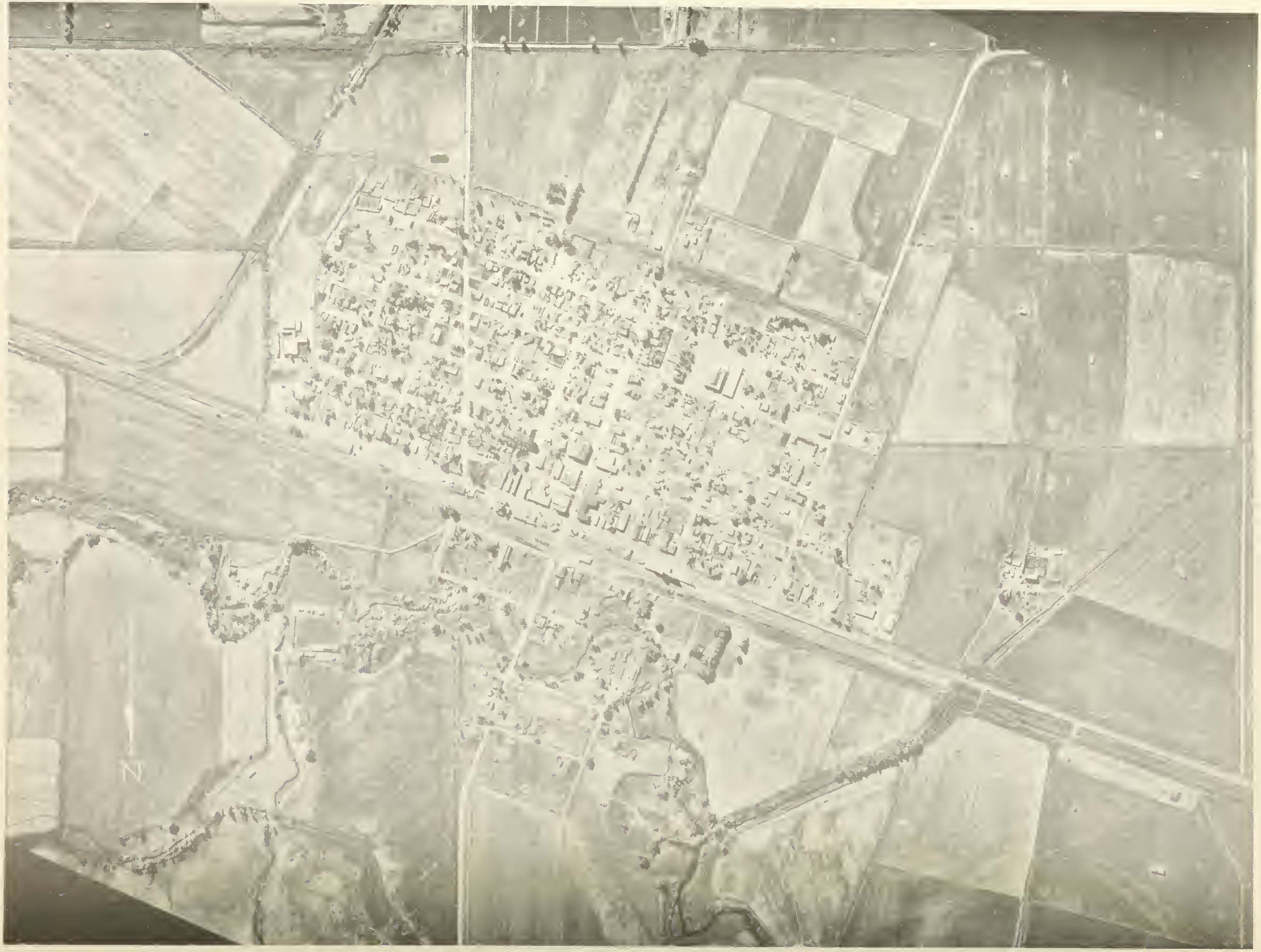
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A review of the problems involved resulted in the recommendation that a written report be made wherein the various routings would be analyzed and factual data presented to assist in the determination of the most favorable location for the new construction.

This report has been prepared to conform to that recommendation. It analyzes the situation from the standpoint of construction costs involved on the alternate locations, the maintenance costs involved and the service to the highway users, as reflected in vehicle operating costs. Construction, maintenance, and vehicle operating costs together comprise highway transportation costs which are paid almost exclusively by the highway user. Construction and maintenance costs are financed through taxes paid by the highway user into the Federal and State highway funds. Vehicle operating costs are also paid by the highway user, and in most instances they exceed by many times the amount of taxes paid for highway construction and maintenance. For this reason, traffic service has an important bearing on the selection of the most favorable location.

This report also describes the effect on land, farming operations and other developments which would be affected by the alternate locations. A review is also made to the extent possible of the nebulous issue of possible loss of business from bypassing traffic.

Harlem, with a 1960 population of 1,267, is the second largest city in Blaine County. It is located about 26 miles east of Chinook, the county seat for Blaine County. Chinook had a population of 2,326 in the 1960 Census. About 45% of the total population of Blaine County is located in these two cities.

Harlem is one of a number of cities along U. S. # 2 which were originally founded as points of importance along the Great Northern Railroad when it was constructed through the area in the 1880's. It is located in the fertile, irrigated Milk River valley, and a substantial part of the economy of the city is oriented to agricultural development and the livestock industry which contribute greatly to the development of the county.

Most of the southeastern quarter of the county is contained within the Fort Belknap Indian Reservation. The agency headquarters are located at Fort Belknap, which is about 5 miles south of Harlem.

The main business district of Harlem is located on Smith Avenue which is a north-south street. U. S. # 2 extends through the city in an east-west direction on a street at the north edge of the business district. The city has a variety of business establishments which serve the primary service and shopping needs for an extensive trade area.

DESCRIPTION OF ALTERNATE ROUTES

Three alternate locations for the new construction have been suggested. They consist of the surveyed line passing to the south and southeast of the city, a line following as closely as possible the present highway through the area, and a line following the present highway through Harlem and continuing eastward along the location of FAS Route 396 to Savoy and beyond to a point east of Dodson.

A detailed analysis of the last line has been obviated for the reason that certain apparent deficiencies in this location have the effect of eliminating it from consideration. Previous correspondence concerning this location summarizes the objections to this proposal:

"Upon completion of the investigation of this north routing, it was removed from further consideration for serveral principal reasons, as follows: (not necessarily listed in order of importance)

1. The north boundary of the Fort Belknap Reservation is mid-channel of the Milk River, so the north route would be entirely off the reservation and would not be eligible for 100 percent Federal funds for construction, as is that corresponding portion of the route south of the river.

2. The estimated cost of the north route is $3.6 million and it would be unusable until it was completed in its entirety. This would take several years and would drain all Primary funds from Financial Districts 2 and 3 and delay all other Primary improvements in these Districts.

3. The Milk River Bridge near Fort Belknap must be replaced in any case to serve the area south of the river.

4. Most of the present highway between Harlem and Dodson is in good condition and would not normally be reconstructed for some time.

5. The north route would require a new overpass over the railroad near Coburg whereas the railroad crossing on the present highway is already built east of Dodson.

6. The plans are now complete for the Harlem project, including the Milk River bridge, funds are programmed, and the work can be underway this summer. This is an extremely important factor inasmuch as this is one of the areas included in the Area Development Program, where there is a critical unemployment situation.

7. The north routing would require field surveys and development of plans before any work could be started and this would require at least one full year to prepare - even the first section - for letting. Such a delay, further extended to the several years that would be required to complete the entire north route to a status of usability, would result in an unreasonable delay in replacing the substandard section of roadway now planned for immediate improvement. Such delaying action could result in unnecessary loss of life and/or property damage, as well as depriving the traveling public of the use of the improvement."

This location suffers from the complications that are encountered every time an attempt is made to leave the present highway and construct on a new location that continues for considerable distance before returning to the present highway. Since the amount of money that can be spent in any financial district is limited by state law, it becomes necessary to extend the construction period over several years with the result that the highway cannot be opened to serve the mainbody of traffic until it is completed throughout its entire length.

In addition to not providing the benefits of prompt service to traffic, there is also the objectionable feature of idle investment of construction funds that could be used to good advantage elsewhere.

The elimination of the proposed line through Savoy reduces this report to the consideration of the surveyed line bypassing the city and the proposed line following the present highway. For convenience, these are referred to as the BYPASS LINE and the EXISTING LINE, respectively.

BYPASS LINE

This is an entirely new location for the highway starting at a point on the present highway about 0.7 mile west of Harlem and extending in a southeasterly direction to another point on the present highway a short distance east of FAS Route 376 leading to Hayes.

Between the western terminus and the Milk River it crosses irrigated farm land on a line which is about 100 feet northeast of and parallel to the high voltage power line through this area. In the crossing of this farm land, there are several parcels which are divided by the highway. The existing irrigation will also have to be re-arranged. Throughout its length, this highway will be constructed to a 32 foot width with a plant mix surface.

The required right-of-way width will be 120 feet. It is planned that all material for the roadbed and surface will be hauled in from other sources.

The section of highway south of the Milk River will be located on grazing land for most of its length. A new bridge over the Milk River will be constructed at a site about 400 feet upstream from the present structure. The length of the new structure will be about 240 feet. The width will be 36 feet.

[illegible]

As a part of the plan for construction of the Bypass Line, it is proposed that FAS Route 241 (Harlem-Turner Road) be extended along Smith Avenue from a point on present U. S. # 2 to a point of connection with the Bypass Line. Smith Avenue is the main street of the city, and the present street will be reconstructed to a high standard municipal facility. This street will have a width of 60 feet from curb to curb. New curbs will be constructed for about two blocks at the south edge of the city. The width of the rural section will be 32 feet of surfaced highway on 120 feet of right-of-way.

The total length of the Bypass Line is 5.220 miles. The extension of FAS Route 241 will be 0.518 miles long, with 0.142 miles being in the rural area and 0.376 miles in the city.

If the Bypass Line is constructed, it will be necessary to delete from the Primary System the section of the present highway which will be replaced by the new construction. Two alternatives are evident; the present highway can be designated as a Secondary System route throughout its length, or FAS Route 396, leading to Savoy, can be extended westward to include the section of the present highway to the western terminus of the Bypass Line. If the later proposal is enacted, the section of the present highway from the eastern terminus of the Bypass Line to FAS Route 396 (Savoy Road) will not be on any State highway system.

EXISTING LINE

This proposal involves the reconstruction of the present highway on a line which will follow quite closely the present highway, with minor adjustments being made to correct undesirable alignment in the city and to improve the right-angle turn east of the city.

The reconstruction will start at the same common terminus with the Bypass Line at a point about 0.7 mile west of the city limits. For about the first 0.7 mile it will be possible to salvage about half of the investment in the present roadbed. As the present highway enters the city, a five degree reverse curve is encountered which was built into the original highway to preserve the existing development. The same type of reverse curve is encountered again at the east edge of the city. Under the reconstruction of the present highway, these will be reduced to one degree curves, thereby improving substantially the alignment through the city.

The present ten degree curve east of the city will be reduced to a three degree curve to reduce the safety hazard. This will also shorten the length of the route by about 300 feet.

It is planned that an additional 60 feet of right-of-way will be acquired adjacent to and south of the present highway on the east side of the city. For the north-south section of the present highway east of the city, it will be necessary to acquire 60 feet of additional highway right-of-way on the west side of the present highway and also an additional 30 feet of right-of-way to permit the relocation of the drainage ditch through this area. This will involve filling in the present ditch to serve as part of the new roadbed and the excavation of a new ditch to the west of the new highway.

The section through the city will be built to a 44 foot width within the present right-of-way. About 6,500 feet of new curb and gutter will be constructed.

As with the Bypass Line, it is expected that all fill and surfacing material will be hauled in from other sources.

The new bridge over the Milk River will be constructed on about the same site as the present bridge. This bridge will be so located that the present curving approaches will be eliminated. It appears that the new bridge on the Existing Line will be somewhat longer than the new bridge on the Bypass Line.

The total length of the Existing Line is 6.041 miles. With the exception of the 44 foot section through the city, the new highway will be constructed to the same 32 foot width as described for the Bypass Line.

CONSTRUCTION COSTS

For the purpose of this report, it has been estimated that equal costs would be incurred for both the Bypass Line and the Existing Line in constructing the new bridge over the Milk River and the section of highway south of the Milk River. It is also apparent that similar and equal problems will be encountered

on both lines in adjusting present irrigation facilities in the area on the north side of the river. All of these costs, therefore, have been included in the same amounts for both alternate highway locations.

Detailed estimates have been prepared for construction costs on the Bypass Line. These same costs have been used as the base for estimating the construction costs for the Existing Line, with the following special considerations:

1. It is estimated that about half of the investment can be salvaged in the rural section of highway west of Harlem on the Existing Line.

2. Special estimates were made for constructing the section of highway through the city on the Existing Line. The same basic figures were used in computing costs for the city section of the extension of FAS Route 241, with the exception that allowance was made for the extra width involved and special curb and gutter requirements.

3. Separate drainage estimates were made for each of the alternate lines. The Existing Line requires that the present ditch along the highway be filled in and a new ditch be excavated outside the road section. This adds to the grading and drainage cost of the Existing Line.

The enclosed table contains a summary of the total construction costs involved for each line and its contingent construction. It also shows the annual amortized cost, without interest, as derived by dividing the total cost for each item by the respective estimated service life.

From this table, it may be noted that the total construction cost for the Bypass Line is $770,528 as compared with $793,945 for the Existing Line. The Bypass Line has a lower total cost principally for the reason that it is shorter by 0.821 mile than the Existing Line. When the necessary contingent construction of FAS Route 241 is included with the Bypass Line, the total cost is increased to $821,291, or $27,346 more than the Existing Line.

The annual amortized construction cost is shown in this table so that these figures may be combined with similar annual figures for maintenance costs and vehicle operating costs in arriving at an overall total of all economic costs involved in the analysis.

Preliminary engineering for both routes is computed on a flat cost-per-mile basis. Construction engineering has been computed at 10% of the construction costs.

Where new highways are constructed through cities to standards above those required for rural highways, the cities are required to pay 25% of the total cost of municipal construction.

In the case of the Bypass Line, the city would be required to pay 25% of the cost of improving the municipal section of the extension of FAS Route 241 along Smith Avenue. This would amount to 25% of $39,950, or $9,987.

COMPARISON OF CONSTRUCTION COSTS

		BYPASS LINE				EXISTING LINE		
		RURAL MAIN	FAS 241 EXTENSION		TOTAL OF ALL	RURAL MAIN		TOTAL OF ALL
COST ITEM	AVE. LIFE	HIGHWAY	RURAL	CITY	SECTIONS	HIGHWAY	CITY SECTION	SECTIONS
Grading and Drainage:		5.220 mi	0.142 mi	0.376 mi	5.738 mi	5.425 mi	0.616 mi	6.041 mi
Total Cost		$315,482	$ 7,906	$ 16,828	$340,216	$283,607	$ 27,000	$310,607
Annual Cost	40	7,887	198	421	8,506	7,090	675	7,765
Surface and Base:								
Total Cost		325,046	7,906	18,123	351,075	314,821	31,767	346,588
Annual Cost	20	16,252	395	906	17,553	15,741	1,588	17,329
Irrigation Adjustments:								
Total Cost		10,000			10,000	10,000		10,000
Annual Cost	40	250			250	250		250
Milk River Bridge:								
Total Cost		120,000			120,000	120,000		120,000
Annual Cost	50	2,400			2,400	2,400		2,400
Miscellaneous:								
Total Cost						6,750		6,750
Annual Cost	30					225		225
SUBTOTAL - CONSTRUCTION:								
Total Cost		770,528	15,812	34,951	821,291	735,178	58,767	793,945
Annual Cost		26,789	593	1,327	28,709	25,706	2,263	27,969
Preliminary Engineering:								
Total Cost		20,880	568	1,504	22,952	21,700	2,464	24,164
Annual Cost	30	696	19	50	765	723	82	805
Construction Engineering:								
Total Cost		77,053	1,581	3,495	82,129	73,518	5,877	79,395
Annual Cost	30	2,568	53	116	2,737	2,451	196	2,647
Right-of-Way:								
Total Cost		44,093	2,000		46,093	19,029		19,029
Annual Cost	50	882	40		922	380		380
GRAND TOTAL:								
Total Cost		$912,554	$ 19,961	$ 39,950	$972,465	$849,425	$ 67,108	$916,533
Annual Cost		30,935	705	1,493	33,133	29,260	2,541	31,801

If the Existing Line is built along the present highway through the city, the total estimated cost is $67,108. The city would be required to pay $16,777 as its share of this cost.

Right-of-way costs have been estimated in some detail for the Bypass Line. It appears that 21 parcels of land will be affected, with severance of land affecting 11 of these. The total estimated cost of right-of-way for the Bypass Line and the extension of FAS Route 241 amounts to $46,093. These estimates do not include incidentals.

The estimated cost of right-of-way for the Existing Line amounts to $19,029 on the basis of the same features which were considered on the Bypass Line. Since the present highway already separates parcels of land, there will be no additional severance of land in the reconstruction process. As mentioned previously, additional right-of-way will be required, however, for the widened highway and the relocation of the existing drainage ditch east of the city.

When the costs for construction, engineering and right-of-way are combined for each route and its contingent construction, the results show that the total overall cost for the Bypass Line is $972,465, and for the Existing Line it is $916,533. This amounts to a total savings of $55,932 in favor of the Existing Line.

When the total costs are amortized on the basis of the estimated service lives, the annual cost amounts to $33,133 for the Bypass Line and $31,801 for the Existing Line. The annual savings amount to $1,332 in favor of the Existing Line.

Both the total savings and the annual savings amount to a differential of less than 1% when compared with the total costs involved.

MAINTENANCE COSTS

It is reported that the cost of maintaining the present highway west of Harlem has been quite moderate; however, it has been expensive to maintain the section of highway east of the city because of the poor drainage conditions and the low-standard surface and base on the highway in this area.

If the Bypass Line is built, it will be necessary to keep the present highway in service for use of the local residents and external traffic which finds it convenient to use the old highway for access to the city. Since it will not remain on the Primary System, the State Highway Department will no longer maintain it after the Bypass Line is built. It is the practice, however, for the State to place it in the best possible condition prior to discontinuing maintenance. Since the great majority of heavy vehicles will divert to the Bypass Line, future maintenance on this highway should not be the problem that it has been in the past.

In computing maintenance costs, it is estimated that the main highway for either the Bypass Line or the Existing Line will cost $1,200 per mile per year for maintenance. The maintenance of the present highway, after construction of the Bypass Line, is estimated at $700 per mile per year.

The following table shows a comparison of maintenance costs under the two alternate highway locations:

COMPARISON OF MAINTENANCE COSTS

	MILES TO MAINTAIN	COST PER MILE PER YEAR	ANNUAL COST
EXISTING LINE:			
New Highway	6.1	$1,200	$ 7,320
BYPASS LINE:			
New Highway	5.2	$1,200	$ 6,240
Old Highway	6.1	700	4,270
FAS 241 Rural	0.2	1,200	240
Total Cost			$10,750

No allowance is included for the maintenance of the municipal section of the extension of FAS Route 241 for the reason that this is a city street which must be maintained regardless of location of the Primary System highway.

TRAFFIC SERVICE

The service to traffic provided by the two alternate highway locations was evaluated by means of a special traffic survey which was conducted in the vicinity of Harlem during the weekdays of August 7, 8, 9, and 10 of 1961. This special survey is known as an origin-destination survey, and it consisted of stopping highway traffic for the principal purpose of determining the origin and destination of each trip and the amount of stopping and non-stopping traffic.

From the information obtained from these interviews, it is possible to determine the amount of traffic having origins or destinations in the city of Harlem, the amount of traffic without an origin or destination in the city but stopping on passage through the city for some reason, and the amount of traffic passing through the city without stopping for any purpose. The interview stations were located at points on U. S. # 2 a short distance east and west of the city limits.

The interviews were obtained during the daylight hours only, but they were expanded to a daily total on the basis of related information obtained from other surveys and other sources. They were further expanded to an average daily figure for the year as derived from the regular traffic counts which are obtained quarterly in this vicinity.

The following table shows the results of this survey:

HARLEM ORIGIN-DESTINATION SURVEY

	PASSENGER CARS		TRUCKS		ALL VEHICLES	
	Number	Percent	Number	Percent	Number	Percent
Trips Starting or Stopping in Harlem	826	53	131	47	957	52
Trips Passing Through Harlem Without Stopping	742	47	145	53	887	48
TOTAL OF ALL TRIPS	1568	100	276	100	1844	100

This table shows that, of all trips at the edge of the city of Harlem, 52% had some reason to stop in the city and 48% passed through the city without stopping. It should be pointed out, however, that a substantial part of this traffic consisted of short trips taken within the immediate vicinity of the city. Such trips would not be served by a highway bypassing the city for the reason that the trip ends would be within the internal area located between the termini of the bypass highway.

In order to determine the amount and proportion of bypassable highway traffic, the interviews were analyzed and the internal trips were segregated from the total of all trips. The remaining trips consisted of trips which started and ended at points on U. S. # 2 beyond the termini of the bypass route.

These are the trips which would benefit from the bypass route, and the data show that 10% of these trips had occasion to stop in Harlem for some purpose and the remaining 90% of the trips pass through the city without stopping. This bypassable traffic would benefit from the shorter travel distance on the bypass route, and there would also be the advantage to the city of Harlem that these non-essential trips would be removed from the city, thereby reducing the internal traffic congestion and improving the safety to pedestrians and local traffic.

This bypassable traffic amounts to 820 vehicles per day, or about 44% of the total highway traffic moving into, through or out of the city. It consists of 692 passenger cars and 128 trucks, which amount to 44% and 46% respectively, of the total number of these vehicles now using the highway through the city. Panels, pickups and other light trucks are classified as passenger cars in these figures.

As a matter of interest, the table on the following page has been prepared to show the distribution of the interviewed traffic according to place of registration of the vehicle and the type of traffic movement involved.

DISTRIBUTION OF TRAFFIC BY REGISTRATION AND TYPE OF MOVEMENT

	PLACE OF REGISTRATION			
TYPE OF MOVEMENT	BLAINE COUNTY	OTHER COUNTIES	OUT OF STATE	TOTAL
Trip Started in Harlem	67%	24%	5%	39%
Trip Stopped in Harlem	6%	13%	11%	13%
Subtotal Starting or Stopping in Harlem	73%	37%	16%	52%
Trip Passing Through Harlem Non-stop	27%	63%	84%	48%
TOTAL	100%	100%	100%	100%

The figures contained in the foregoing table are not directly comparable with the figures reported previously regarding the proportion of bypassable traffic for the reason that the bypassable traffic pertains only to movement on U. S. # 2. The figures in this table include all traffic interviewed at the points near the city limits. For example, a vehicle on FAS Route 241 passing through Harlem enroute to Malta would be classified as a non-stop trip in this table, but since this vehicle would have to pass through Harlem regardless of the highway location, it would not be classified as bypassable traffic.

In elaboration of the data presented in the foregoing table, it is interesting to note that, of all the trips starting or stopping in Harlem, 15% were out-of-state vehicles, 53% were from Blaine County and 32% were from other Montana counties. Of the vehicles passing through the city without stopping, 52% were from outside the state, 13% were from Blaine County, and 35% were from other Montana counties.

The routing of each trip reported during the origin-destination survey was analyzed for each of the alternate routes in order to determine the effect that these routes would have on the traffic service to the highway user.

The reconstruction on the Existing Line would serve the same traffic that is now using the present highway. The benefits to this traffic would result from being able to use a higher-standard new highway in place of the present deteriorated highway. There would be a small improvement in the correction of the offsets through Harlem. There would also be an improvement in the radius of the curve east of the city. These improvements would shorten the travel distance of the present highway by about 300 feet, or 0.056 mile.

The reconstruction on the Existing Line would not eliminate the necessity for through traffic to pass through the center of the city or to incur the added operating costs involved in reducing from normal highway speed to 25 miles per hour and then increasing again to normal highway speed. There would also be the continuing safety hazard associated with congested city traffic.

If the Bypass Line were to be constructed, the through traffic would be able to divert to this line and avoid the added expense of extra travel distance and the congestion and slow-down which are involved in travel through the business district. The Bypass Line is 0.877 mile shorter than the present highway through Harlem, and this would amount to a 14% reduction in travel distance for the through traffic.

The Bypass Line would also shorten the travel distance for all trips with origins, destinations or stops in Harlem, with the exception of the trips between the west terminus and the internal area. For example, a trip originating beyond the west terminus and headed for the east terminus, with a stop in Harlem, could use the present highway from the west terminus into Harlem, the extension of FAS Route 241 to the bypass highway, and the bypass highway from there to the east terminus. Such a trip would save 0.377 mile over the use of the present highway.

The same reduction in travel distance would occur for all trips between Harlem and the east terminus. The only trips which would not benefit from the Bypass Line would be those trips between Harlem and the west terminus and the internal trips which would not have occasion to reach the Bypass Line. Such trips would continue to use the present highway without the benefit of the lower operating costs associated with the new construction.

The evaluation of vehicle operating costs under these different conditions is described under the next section pertaining to VEHICLE OPERATING COSTS.

VEHICLE OPERATING COSTS

The cost of vehicle operation over each of the alternate routes has been evaluated by analyzing each trip to determine the travel distance over each type of highway facility and multiplying the related travel distance by an established cost figure per vehicle mile of travel. The following table shows the vehicle operating cost figures which were used in this analysis:

UNIT VEHICLE OPERATING COST FIGURES

TYPE OF FACILITY	PASSENGER CARS	TRUCKS
Present City Streets	$.1265	$.3610
New City Streets	.1230	.3510
Present Rural Highway	.1091	.3115
New Rural Highway	.1057	.3016

The table on the following page presents the results of the computations of the vehicle operating costs for travel on the present highway under existing conditions, the travel over the present highway when reconstructed as the Existing Line, and the combination of travel on the Bypass Line and the present highway where the trips could not utilize the Bypass Line in part or entirely.

COMPARISON OF ANNUAL VEHICLE OPERATING COSTS

LOCATION OF HIGHWAY	TRIPS WITH STOPS AND STARTS IN HARLEM	THROUGH NON-STOP TRIPS	TOTAL OF ALL TRIPS
PRESENT HIGHWAY:			
Daily Trips	957	887	1,844
Average Trip Length (Miles)	3.014	5.433	4.177
Annual Vehicle-Miles of Travel	1,052,805	1,758,961	2,811,766
Average Cost Per Vehicle-Mile	$.1404	$.1435	$.1423
Annual Vehicle Operating Costs	$147,814	$252,411	$400,225
BYPASS LINE:			
Daily Trips	957	887	1,844
Average Trip Length (Miles)	2.785	4.811	3.760
Annual Vehicle-Miles of Travel	972,814	1,557,585	2,530,399
Average Cost Per Vehicle-Mile	$.1371	$.1367	$.1369
Annual Vehicle Operating Costs	$133,373	$212,922	$346,295
EXISTING LINE:			
Daily trips	957	887	1,844
Average Trip Length (Miles)	2.989	5.385	4.142
Annual Vehicle-Miles of Travel	1,044,073	1,743,421	2,787,494
Average Cost Per Vehicle-Mile	$.1359	$.1392	$.1380
Annual Vehicle Operating Costs	$141,889	$242,684	$384,573

This table shows that the average trip length for all movements under the Bypass Line would be reduced by 0.417 mile as compared with the present highway. This would result in a reduction of 281,367 vehicle miles per year in total travel. Both figures amount to about a 10% reduction as compared with use of the present highway. Through the availability of improved highway facilities on the Bypass Line, the unit operating cost per vehicle mile would be reduced by $.0054 as compared with the use of the present highway. When all of these factors are combined, the construction of the Bypass Line would reduce the operating cost to the traveling public by $53,930 per year as compared with present conditions of traveling on the present highway.

A similar comparison involving the reconstruction of the present highway as the Existing Line shows that the average trip length would be reduced by 0.035 mile and the annual vehicle miles of travel would be reduced by 24,272. Both of these figures amount to a reduction of about 0.85% as compared with use of the present highway. The unit cost per vehicle-mile of travel would be reduced by $.0043. The total cost of vehicle operating would be reduced by $15,652 per year as compared with travel on the present highway.

The foregoing figures do not take into consideration the cost to the traveling public of the slow-down encountered in passing through the business district of Harlem. As reported previously, there are 692 passenger cars and 128 trucks that now pass through Harlem without stopping in traveling between the east and west termini of the Bypass Line. These vehicles must decelerate from the normal

highway speed to 25 miles per hour in passing through Harlem and then accelerate again to the normal highway speed. By being able to use the Bypass Line, this action would not be necessary, and annual savings of $9,055 would be realized.

Since the reconstruction of the present highway as the Existing Line would not change this slow-down action, there would be no savings for the Existing Line.

In summary, therefore, it is evident that the location of the new highway on the Bypass Line would save the traveling public a total of $53,930 in basic vehicle operating costs and $9,055 in elimination of slow-downs, making a total savings of $62,985 in annual operating costs.

The reconstruction of the new highway on the Existing Line would save the motorist $15,652 per year in basic vehicle operating costs. There would be no elimination of slow-downs and consequently no savings in this category

It has been suggested that, since the origin-destination survey was taken during the month of August, there might be an overemphasis on the proportion of through traffic. This would occur for the reason that there would be a higher proportion of out-of-state and out-of-county traffic which would be less inclined to stop in Harlem than would be the resident of the local area.

The possibility of this occurrance was investigated by analyzing the regular traffic counts which are taken quarterly in this vicinity. These visual counts classify the traffic according to the categories of out-of-state passenger cars, Montana passenger cars, and trucks.

The average of the quarterly visual counts show that the amount of truck traffic during the year was about equal to the amount of truck traffic covered during the origin-destination survey. There is no reason, therefore, to adjust the figures for truck traffic.

It is known that the local resident will travel less during the wintertime when weather conditions may discourage general travel. He also travels more during the summertime when there is less restriction on general travel. Farmers and ranchers travel more than usual during seasonal planting, harvesting, and marketing operations. On the whole, however, these extra movements are spread over much of the year and would tend to equalize at a level somewhere near the figure obtained during the August survey. It was assumed, therefore, that there would be no reason for an adjustment in the travel of the Blaine County residents as obtained during the origin-destination survey.

The quarterly counts show that the yearly average of out-of-state vehicles in the vicinity of Harlem is about 75% of the number counted during the August origin-destination survey. It is known that the peak movement of tourists occurs during July and August with a general increase during the period from Memorial Day to Labor Day. Since this peak period is also used in computing the average for the year, the actual difference between the average for the year and the figure for August assumes smaller proportions.

After reviewing the matter from the standpoint of the comparison of the August survey with the quarterly traffic counts, it appeared that the number of through trips should be decreased by 10% and the amount of stopping trips should

be increased proportionately. The application of these adjustments to the operating cost figures for the Bypass Line resulted in an increase of $2,558 for this route. This resulted in a new figure of $60,437 in annual savings to the highway user through use of the Bypass Line in place of the previous figure of $62,985 derived from the August origin-destination survey. The application of the same 10% adjustment for through trips reduces the value of slow-down eliminations from $9,055 per year to $8,150 per year.

SUMMARY OF COSTS

In order to make a valid comparison of the merits of the alternate routes, it is necessary to consider the combination of construction costs, maintenance costs, and vehicle operating costs as a measure of the overall standing of the routes. The following table presents a comparison of the individual costs for the two alternates and the combination of all costs:

COMPARISON OF ANNUAL COSTS

TYPE OF COST	BYPASS LINE	EXISTING LINE	DIFFERENCE IN FAVOR OF
Construction, Engineering, and Right-of-Way	$ 33,133	$ 31,801	$ 1,332 Existing Line
Maintenance	10,750	7,320	3,430 Existing Line
Basic Vehicle Operation	348,853	384,573	35,720 Bypass Line
Slow-down for Through Traffic	---	8,150	8,150 Bypass Line
COMBINED COSTS	$392,736	$431,844	$39,108 Bypass Line

This table shows that the reconstruction of the Existing Line would be preferable from the standpoint of annual construction, engineering, right-of-way and maintenance costs. The Existing Line would save $4,762 per year in these costs as compared with the Bypass Line.

When overall vehicle operating costs are considered, the Bypass Line would be best since it would save the traveling public $43,870 per year. It should be noted that these costs, as shown in the above table for the Bypass Line, have been adjusted to compensate for any overemphasis on through trips as derived from the August origin-destination survey.

When all applicable costs are taken into consideration, the Bypass Line has a net benefit of $39,108 per year as compared with the Existing Line. This amounts to a differential of about 10% in favor of the Bypass Line.

It must be concluded, therefore, that the Bypass Line would be the preferred location for the new highway from the standpoint of the highway user on the basis of taxes paid for support of the highway and the cost of operating his motor vehicle.

BYPASS TRAFFIC

There is a natural apprehension among the businessmen that the construction of a bypass route around a city might result in a substantial loss of business to that city. It has been claimed that the practice of bypassing cities will result in a serious economic loss to the state as a whole. The fallacy of this hypothesis lies in the fact that the motorist is not going to travel through the state without buying necessary gasoline, eating his regular meals, stopping at night for sleep at some place of lodging, and purchasing the other essentials or luxuries that he desires.

It is possible that the business places may derive some patronage from the motorist passing through a city who had no intention of stopping but did stop when he spotted a particularly attractive place or was reminded by signs or other advertising that he needed some item. Such occurrences, however, are minor in the normal travel pattern.

In the early days of highway transportation, with lower speeds and less dependable cars, it was the practice to travel from place to place with advantage being taken of acquiring gasoline, oil, air for tires, and other items wherever they were obtainable. In some instances, it was popular to carry extra supplies of gasoline, oil and water on the running boards. Practically every community received its proportionate share of this business.

With the improvement in highways, and more particularly the improvement in motor vehicles, there has been a growing tendency to travel greater distances per day and to plan ahead for places to stop, to eat or sleep. The Montana Tourist Survey of 1958 showed that the average traveler covered 345 miles per day, with out-of-state residents averaging 373 miles per day. Most automobiles today can travel 250 miles on a tank of gasoline and many can travel close to 300 miles per tank. This is about the equivalent of four hours of travel, which coincides quite closely with the time between meals. For this reason, there is a tendency to buy gasoline and meals in the same city, and this city is also very often the place in which the overnight stay is made.

If the motorist is getting hungry or his gasoline tank is getting low, there is no reluctance for him to leave the main highway and drive into the nearest city to satisfy his needs, provided that the main highway is not too far from the business district and the city is of sufficient size to provide the facilities that he needs, especially facilities that will invite him to stop.

It has been said that the bypassing of smaller cities encourages the motorist to favor the larger cities. This is more the result of changing times than it is the product of bypassing cities. In earlier times, tourist cabins were literally "cabins" and any person with a small amount of capital or good credit resources could erect a few cabins which would compete with similar cabins farther down the highway. These cabins are generally occupied today by semi-transients or low-income families or else they have been closed as the result of obsolescence. The "cabin" of today is a multi-storied motor hotel with restaurants, service stations and other tourist facilities in conjunction or close proximity.

Such expensive establishments are not practical in the smaller communities, so they are built in the larger cities where the tourist has developed a habit of staying because of the variety of facilities and the opportunity to enjoy better recreational activities during the evening hours.

The importance of larger cities as the stopping place for highway traffic is evidenced by a report prepared from origin-destination surveys taken throughout the Nation. This report shows that the proportion of highway traffic approaching a city, that stops in the city, is directly related to the population of that city. This report shows that about 50% of the approaching traffic stop in cities of around 5,000 population. For cities of 50,000 to 100,000 population, about 85% of the approaching traffic has occasion to stop in the city.

There is a shortage of data for cities the size of Harlem; however, the figure of 10% of the external approaching traffic stopping in the city, as derived from the origin-destination survey, conforms to the trend line established by larger cities.

The concern about the loss of business to a bypassed community is not confined to this state alone. This same concern has been expressed in most other states where bypasses were being built. Many of these states were fortunate enough to have a source of information through sales tax receipts to measure the effect on bypassed communities. By comparing the sales in a community with one or more control areas, it is possible to nullify the effects of economic fluctuations in appraising the "before and after" effects of the bypasses. The results of these reports show that in the great majority of cases, the bypass helped the economic activity of the community instead of hurting it.

It has been reported that establishments catering to highway traffic, such as service stations, motels and restaurants, experienced some decrease in sales in the initial phases of conversion; however, later adjustments overcame these losses. In some instances the older places did not fully recoup their losses for the reason that new establishments were located in the vicinity of the bypass route. These places received some of the business that formerly went to the older places. Establishments which were not oriented to highway traffic generally showed an increase in business resulting from greater freedom of movement in the business district because of the elimination of non-essential, through traffic from the main street. The reports show that individual businesses may be adversely affected, depending on local circumstances; however, the general economic activity of the community showed an increase after the bypass had been open to traffic for a reasonable length of time.

An appropriate summary of the bypass situation is contained in a report entitled "How Bypasses Affect Business" which has been published by the Chamber of Commerce of the United States. The following is an excerpt from the foreword of this report:

"Bypasses will be an integral part of this road building program. Such bypasses are more often than not a matter of great concern to businessmen located along the old route. The term "bypass" often has had an ominous sound to the businessman. It has the connotation of being "left out" --something taken away from him. This is not a true meaning of the word as used in connection with modern bypasses. Such bypasses are truly "relief routes" to take unnecessary

through traffic away from the congested business streets thereby freeing them for traffic of a more profitable nature. Both the through traffic and local business are benefited.

This booklet is written to give businessmen a clearer understanding of the true effects of such bypasses. It includes reports of carefully conducted studies comparing the effects of such bypasses on business, property values, traffic volume, etc. "before" and "after" the new facilities were built. In general, the factual studies made and the testimony from businessmen have proven that in most cases bypasses produce many benefits for the community and justify the businessman giving his cooperation and support to the various bypass programs."

It is not possible to make a general assumption that, since experience in other states has shown that bypassed communities are benefited, the same situation would have universal application in this state. Nor is it practical to assume that a bypass is necessary for every city.

The value of a bypass depends on an analysis of the following factors:

1. The volume of traffic on the highway passing through the city. There certainly would be more justification for constructing a bypass where the present highway through a small city was carrying 10,000 vehicles per day than there would be where the highway was carrying 1,000 vehicles per day.

2. The proportion of the approaching traffic that has reason to stop in the city. With small cities, the proportion of stopping traffic is relatively low and the bypassable traffic is much greater. The construction of a bypass will greatly benefit this predominant volume of traffic. With the larger cities, the reverse situation applies. The great majority of the traffic wishes to stop in the city and an effort should be made to provide the necessary highway facilities to serve the entering traffic. A bypass may also be desirable in larger cities to route the through traffic away from the city center.

3. The distance saved via the bypass route. Because of the travel characteristics of early-day traffic, it was important to locate the main highway so that it would serve the maximum number of local residents and local communities. In many cases this resulted in increased highway length. With the changing pattern towards more through trips and long distance trips, it becomes economically beneficial to straighten the highways and shorten them. Bypasses perform this function in many instances.

4. Degree of access to the community. The effect of a bypass highway on a community depends to considerable extent on the degree of access provided to the community and the distance from the bypass route to the city center. Obviously, the potential loss of business to a community would be greater if the main highway is located five miles from the city than it would be if the main highway is located one-quarter mile from the city. Also, the ease of access depends on the number of access points and their locations.

The foregoing is a general review of the features pertaining to the construction of bypass highways. Most of the information concerning this matter has been developed from experience in other states where authentic "before and after" data can be obtained from official records. The lack of such records in this state has placed undue emphasis on personal opinion concerning the effect of bypasses.

Over a period of years, several places in this state have been bypassed as a part of the effort to provide better and safer highways for the traveling public. To have done otherwise would have perpetuated situations which were appropriate many years ago but which do not conform to modern highway transportation needs. Undoubtedly the bypass action has had a detrimental effect on individual establishments, but it is probable in some instances that relocation of the highway served only to hasten the inevitable change that is associated with growth and progress.

There does not appear to be a major change in the economic status of the places that have been bypassed in Montana. In many instances, real estate values have been increased in the vicinity of the new highway and new establishments have been built along the highway, thereby adding to the tax base and the economy of the area. In one instance, the Primary System highway was located on a new line bypassing the community, and recently the local residents voted in favor of also bypassing the community with new Secondary System construction. This is a resort community which relies heavily on highway traffic but through experience it has recognized the benefits of routing non-essential traffic away from the center of the community.

SUMMARY

The following points should be considered in connection with a bypass highway in the vicinity of Harlem:

1. Of the traffic approaching the city from the east and the west, about 90% of the trips would have no occasion to stop in the city. About 10% of the trips have some reason for stopping in the city. If the new highway is constructed along the line of the present highway, the effect would be to route 90% of the external trips through the city so that 10% of the external trips could stop in the city.

2. When all trips are taken into consideration, both internal and external, about 45% of the total traffic would be able to use the bypass highway. Of the remaining 55% of the total traffic, some trips would be confined to using the old highway in entirety, other trips would be able to use the new highway for the least part of the movement. If the new construction follows the existing highway, all traffic would benefit from the new standards.

3. From the standpoint of vehicle operating costs, the Bypass Line would save the highway user about $44,000 per year, as compared with the Existing Line.

4. From the standpoint of construction, engineering, right-of-way and maintenance costs, the Existing Line would save the highway user about $5,000 per year in taxes paid for support of highways, as compared to the Bypass Line.

5. When these separate costs are combined, the net effect is an overall savings to the highway user of about $39,000 per year in favor of the Bypass Line.

6. If the present highway is reconstructed as the Existing Line, the highway would remain on the Primary System where the the maintenance cost would be borne by the State Highway Department. If the Bypass Line is built, it would be placed on the Primary System and would be maintained by the State Highway Department. Under these conditions, the present highway could be placed on the Secondary System or it could be absorbed in the county road system. In either event, the maintenance obligation would have to be assumed by the county and city.

7. The construction of the Bypass Line would also involve the reconstruction of Smith Avenue, which would be improved to high standards. This would confer substantial benefits to the local traffic and local residents using this city street. If the present highway were to be reconstructed as the Existing Line, Front Street through Harlem would also be improved to high standards. In either event, the city would be expected to pay 25% of the cost of the construction to municipal standards.

8. The possibility of loss of business to the city if the Bypass Line is built is something that cannot be clearly defined. As reported previously, studies in other states have shown that such loss is negligible. Where other communities have been bypassed in this state, there is no evidence of any major loss of business. A brief which was submitted by local interests at the public hearing estimated that losses for individual businesses would range up to 50% or more. It was also estimated that 35 employees would be lost out of a total of 85 employees. The list of establishments showing a severe loss of business included a number of places that are not ordinarily oriented to highway traffic. Examples include a grain elevator, barber shop, farm equipment dealer, dress shop, and others. It is difficult to understand why a bypass serving through traffic would result in a loss of business to such establishments.

9. If the economy of the city of Harlem is directly related to highway traffic, it would appear that the city would have grown over the years in proportion to the amount of highway traffic passing through the city. From 1941 to 1960, traffic on U. S. # 2 in the vicinity of Harlem has increased from 675 vehicles per day to 1,436 per day, an increase of 127%. From 1941 to 1960, the number of out-of-state passenger cars has increased from 90 to 352 or 291%. During the period of 1940 to 1960, the population of Harlem has grown from 1,166 persons to 1,267 persons, an increase of 9%. This is major evidence that the economy of the city is not highly dependent on highway traffic. It further

supports the evidence that the trend is toward movement between large cities and long distance trips without stopping.

In conclusion, it is evident that the construction of the new highway on the Bypass Line would improve the overall highway transportation situation in the vicinity of Harlem and it would save the highway user about $39,000 per year over reconstruction on the Existing Line, when consideration is given to vehicle operating costs and taxes paid for support of the highway facilities.

Since the construction of the Bypass Line would leave the present highway intact and in service, Harlem would have the same access points from this highway that it now experiences. In addition, a new point of access would be available by way of Smith Avenue which would provide a direct connection to the main business street. The reconstruction of this street to a high-standard municipal facility would shorten the travel distance for residents and non-residents alike, and it would be a valuable asset to the city.

With three access points and a new highway located only a short distance from the business district, it is difficult to understand how there could be a serious economic loss to the city. It is true that there may be individual hardship cases, but this situation would apply to both lines. Any hardship to one person would be more than offset by benefits to many persons. From the overall standpoint, the Bypass Line should provide the greatest economic benefit.

It is also of interest to note that the savings of $39,000 per year in favor of the Bypass Line amounts to a total savings of $1,170,000 when accumulated over the estimated 30 year life for the new construction. This figure is about $198,000 more than the total cost for construction, engineering and right-of-way on the Bypass Line.

This is a conservative figure based on present traffic. Considering future traffic benefits, the total savings over the 30 year period could very well double the figure shown above.